

**What is claimed is:**

1. A bone cement mixing apparatus, comprising:
  - a handle;
- 5       an input gear which is caused to rotate about a central axis in response to rotation of said handle, wherein (i) said input gear includes a first input gear teeth set and a second input gear teeth set, (ii) said first input gear teeth set is spaced a first radial distance from said central axis, (iii) said second input gear teeth set is spaced a second radial distance
- 10      from said central axis, (iv) said second radial distance is greater than said first radial distance, (v) said first input gear teeth set extends outwardly away from said central axis, and (vi) said second input gear teeth set extends inwardly toward said central axis;
- 15      an intermediate gear, wherein said input gear is configured so that during rotation thereof (i) said first input gear teeth set meshingly engages said intermediate gear during a first period of time, and (ii) said second input gear teeth set meshingly engages said intermediate gear during a second period of time which is different from said first period of time;
- 20      an output gear which is caused to rotate in response to rotation of said intermediate gear; and
- a mixing blade which is caused to rotate in response to rotation of said output gear.

2. The bone cement mixing apparatus of claim 1, further comprising:

a first gear housing portion; and  
5 a second gear housing portion,  
wherein a gear chamber is defined when said first gear housing portion is secured to said second gear housing portion,  
wherein said input gear, said intermediate gear, and said output gear are positioned within said gear chamber, and  
10 wherein said handle and said mixing blade are positioned outside of said gear chamber.

3. The bone cement mixing apparatus of claim 1, wherein:  
said central axis lies in a plane which divides said input gear into a  
15 first input gear side and a second input gear side,  
said input gear is configured so that (i) said first input gear teeth set is positioned entirely on said first input gear side, and (ii) said second input gear teeth set is positioned entirely on said second input gear side.

20 4. The bone cement mixing apparatus of claim 1, wherein:  
said mixing blade includes a shaft and a number of vanes extending outwardly from said shaft, and  
said shaft is aligned with said central axis.

5. The bone cement mixing apparatus of claim 1, wherein said intermediate gear rotates about an offset axis which is spaced apart from said central axis.

- 5           6. The bone cement mixing apparatus of claim 2, wherein:
- said intermediate gear rotates about an offset axis which is spaced apart from said central axis,
- said second gear housing portion includes a post which is aligned with said offset axis, and
- 10          said intermediate gear includes an aperture which receives said post so as to rotatably couple said intermediate gear to said second gear housing portion.

- 15          7. The bone cement mixing apparatus of claim 1, wherein said intermediate gear meshingly engages said output gear.

8. The bone cement mixing apparatus of claim 1, wherein said output gear is caused to rotate about said central axis in response to rotation of said intermediate gear.

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9. The bone cement mixing apparatus of claim 1, wherein said input gear is non-rotatably secured to said handle.

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10. The bone cement mixing apparatus of claim 1, wherein:  
said input gear has a ring-shaped slot defined therein,  
said intermediate gear includes a post which is received within said  
ring-shaped slot,  
5           said post is located in said slot during rotation of said input gear.

11. The bone cement mixing apparatus of claim 1, wherein:  
said intermediate gear is driven in a first direction of rotation during  
said first period of time,  
10          said intermediate gear is driven in a second direction of rotation  
during said second period of time, and  
              said first direction of rotation is opposite to said second direction of  
rotation.

15          12. The bone cement mixing apparatus of claim 11, wherein said  
input gear travels in said second direction of rotation during both said first  
period of time and said second period of time.

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13. The bone cement mixing apparatus of claim 1, wherein:

said intermediate gear is driven to rotate at a first angular velocity

during said first period of time,

said intermediate gear is driven to rotate at a second angular

5 velocity during said first period of time, and

said first angular velocity is less than said second angular velocity.

14. The bone cement mixing apparatus of claim 1, wherein:

said intermediate gear is driven to rotate at a first output angular

10 velocity in response to said input gear being rotated at an input angular

velocity,

said intermediate gear is driven to rotate at a second output

angular velocity in response to said input gear being rotated at said input

15 angular velocity, and

said first angular velocity is less than said second angular velocity.

15. The bone cement mixing apparatus of claim 1, wherein:

in response to said input gear being rotated one revolution in a

clockwise direction of rotation, said intermediate gear is driven (i) a first

20 rotational distance in a counterclockwise direction of rotation, and (ii) a

second rotational distance in a clockwise direction of rotation, and

said first rotational distance is less than said second rotational

distance.

16. The bone cement mixing apparatus of claim 15, wherein:  
said intermediate gear meshingly engages said output gear, and  
said output gear is non-rotatably coupled to said mixing blade.

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~~17.~~ A bone cement mixing apparatus, comprising:  
a handle;  
an input gear which is caused to rotate in response to rotation of  
said handle,  
an intermediate gear which is caused to rotate in response to  
10 rotation of said input gear;  
an output gear which is caused to rotate in response to rotation of  
said intermediate gear; and  
a mixing blade which is caused to rotate in response to rotation of  
said output gear,  
15 wherein, in response to said input gear being rotated one  
revolution, said intermediate gear is driven (i) a first rotational distance in  
a counterclockwise direction of rotation, and (ii) a second rotational  
distance in a clockwise direction of rotation, and  
wherein said first rotational distance is less than said second  
20 rotational distance.

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18. The bone cement mixing apparatus of claim 17, wherein:  
said intermediate gear meshingly engages said output gear, and  
said output gear is non-rotatably coupled to said mixing blade.

5           19. The bone cement mixing apparatus of claim 17, further  
comprising:

a first gear housing portion; and  
a second gear housing portion,  
wherein a gear chamber is defined when said first gear housing  
10 portion is secured to said second gear housing portion,  
wherein said input gear, said intermediate gear, and said output  
gear are positioned within said gear chamber, and  
wherein said handle and said mixing blade are positioned outside  
of said gear chamber.

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20. The bone cement mixing apparatus of claim 17, wherein said  
input gear is non-rotatably secured to said handle.

21. A bone cement mixing apparatus, comprising:
- a handle;
- an input gear which is caused to rotate in response to rotation of said handle,
- 5           an intermediate gear which is caused to rotate in response to rotation of said input gear;
- an output gear which is caused to rotate in response to rotation of said intermediate gear; and
- 10          a mixing blade which is caused to rotate in response to rotation of said output gear,
- wherein said intermediate gear is driven to rotate at a first output angular velocity during a first period of time in response to said input gear being rotated at an input angular velocity,
- wherein said intermediate gear is driven to rotate at a second output angular velocity during a second period of time in response to said input gear being rotated at said input angular velocity,
- 15          wherein said first angular velocity is less than said second angular velocity, and
- wherein said first period of time is different from said second period of time.

22. The bone cement mixing apparatus of claim 21, wherein:  
said intermediate gear is driven in a first direction of rotation during  
said first period of time, and  
said intermediate gear is driven in a second direction of rotation  
5 during said second period of time,  
wherein said first direction of rotation is opposite to said second  
direction of rotation.
- 10 23. The bone cement mixing apparatus of claim 21, wherein:  
said intermediate gear meshingly engages said output gear, and  
said output gear is non-rotatably coupled to said mixing blade.
- 15 24. The bone cement mixing apparatus of claim 21, further  
comprising:  
a first gear housing portion; and  
a second gear housing portion,  
wherein a gear chamber is defined when said first gear housing  
portion is secured to said second gear housing portion,  
wherein said input gear, said intermediate gear, and said output  
20 gear are positioned within said gear chamber, and  
wherein said handle and said mixing blade are positioned outside  
of said gear chamber.

25. The bone cement mixing apparatus of claim 21, wherein said input gear is non-rotatably secured to said handle.

26. A bone cement mixing apparatus, comprising:

5       an input gear which is configured to rotate about a central axis, wherein (i) said input gear includes a first input gear teeth set and a second input gear teeth set which are spaced apart from each other, and (ii) said first input gear teeth set extends outwardly away from said central axis, and (iii) said second input gear teeth set extends inwardly toward

10      said central axis;

          an intermediate gear, wherein said input gear is configured so that during rotation thereof (i) said first input gear teeth set meshingly engages said intermediate gear during a first period of time, and (ii) said second input gear teeth set meshingly engages said intermediate gear

15      during a second period of time which is different from said first period of time; and

          a mixing blade which is caused to rotate in response to rotation of said intermediate gear.

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27. The bone cement mixing apparatus of claim 26, further comprising an output gear, wherein:

    said output gear is caused to rotate in response to rotation of said intermediate gear, and

5       said mixing blade which is caused to rotate in response to rotation of said intermediate gear.

28. The bone cement mixing apparatus of claim 27, wherein:

    said intermediate gear meshingly engages said output gear, and  
10       said output gear is non-rotatably coupled to said mixing blade.

29. The bone cement mixing apparatus of claim 26, further comprising:

    a first gear housing portion; and  
15       a second gear housing portion,  
    wherein a gear chamber is defined when said first gear housing portion is secured to said second gear housing portion,  
    wherein said input gear and said intermediate gear are positioned within said gear chamber, and  
20       wherein said mixing blade is positioned outside of said gear chamber.

30. The bone cement mixing apparatus of claim 26, further comprising a handle, wherein said input gear is caused to rotate about said central axis in response to rotation of said handle.

5           31. The bone cement mixing apparatus of claim 26, wherein:  
              said central axis lies in a plane which divides said input gear into a first input gear side and a second input gear side,  
              said input gear is configured so that (i) said first input gear teeth set is positioned entirely on said first input gear side, and (ii) said second  
10          input gear teeth set is positioned entirely on said second input gear side.

32. The bone cement mixing apparatus of claim 26, wherein:  
              said mixing blade includes a shaft and a number of vanes extending outwardly from said shaft, and  
15          said shaft is aligned with said central axis.

33. The bone cement mixing apparatus of claim 26, wherein said intermediate gear rotates about an offset axis which is spaced apart from said central axis.

34. The bone cement mixing apparatus of claim 29, wherein:
- said intermediate gear rotates about an offset axis which is spaced apart from said central axis,
- said second gear housing portion includes a post which is aligned
- 5     with said offset axis, and
- said intermediate gear includes an aperture which receives said post so as to rotatably couple said intermediate gear to said second gear housing portion.
- 10       35. The bone cement mixing apparatus of claim 27, wherein said output gear is caused to rotate about said central axis in response to rotation of said intermediate gear.
36. The bone cement mixing apparatus of claim 30, wherein said
- 15     input gear is non-rotatably secured to said handle.
37. The bone cement mixing apparatus of claim 26, wherein:
- said input gear has a ring-shaped slot defined therein,
- said intermediate gear includes a post which is received within said
- 20     ring-shaped slot,
- said post is located in said slot during rotation of said input gear.

38. The bone cement mixing apparatus of claim 26, wherein:
- said intermediate gear is driven in a first direction of rotation during
- said first period of time,
- said intermediate gear is driven in a second direction of rotation
- 5   during said second period of time, and
- said first direction of rotation is opposite to said second direction of rotation.

39. The bone cement mixing apparatus of claim 38, wherein said
- 10   input gear travels in said second direction of rotation during both said first period of time and said second period of time.

40. The bone cement mixing apparatus of claim 26, wherein:
- said intermediate gear is driven to rotate at a first angular velocity
- 15   during said first period of time,
- said intermediate gear is driven to rotate at a second angular velocity during said second period of time, and
- said first angular velocity is less than said second angular velocity.

41. The bone cement mixing apparatus of claim 26, wherein:  
said intermediate gear is driven to rotate at a first output angular  
velocity during said first period of time in response to said input gear  
being rotated at an input angular velocity,  
5           said intermediate gear is driven to rotate at a second output  
angular velocity during said second period of time in response to said  
input gear being rotated at said input angular velocity, and  
              said first angular velocity is less than said second angular velocity.
- 10           42. The bone cement mixing apparatus of claim 26, wherein:  
              in response to said input gear being rotated one revolution in a  
clockwise direction of rotation, said intermediate gear is driven (i) a first  
rotational distance in a counterclockwise direction of rotation, and (ii) a  
second rotational distance in a clockwise direction of rotation, and  
15           said first rotational distance is less than said second rotational  
distance.

43. A bone cement mixing apparatus, comprising:
- an input gear which is configured to rotate about a central axis,  
wherein (i) said input gear includes a first input gear teeth set and a  
second input gear teeth set which are spaced apart from each other, and
- 5 (ii) said first input gear teeth set extends outwardly away from said central  
axis, and (iii) said second input gear teeth set extends inwardly toward  
said central axis;
- a slave gear which is caused to rotate in response to rotation of  
said input gear; and
- 10 a mixing blade which is caused to rotate in response to rotation of  
said slave gear.

44. The bone cement mixing apparatus of claim 43, wherein said  
input gear is configured so that during rotation thereof (i) said first input  
15 gear teeth set meshingly engages said slave gear during a first period of  
time, and (ii) said second input gear teeth set meshingly engages said  
slave gear during a second period of time which is different from said first  
period of time.

45. The bone cement mixing apparatus of claim 43, wherein:
- said central axis lies in a plane which divides said input gear into a first input gear side and a second input gear side,
- said input gear is configured so that (i) said first input gear teeth
- 5 set is positioned entirely on said first input gear side, and (ii) said second input gear teeth set is positioned entirely on said second input gear side.

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